CLIMATE CONSIDERATIONS FOR HABITAT RESTORATION

HABITAT RESTORATION IN A CHANGING CLIMATE

The Maryland Department of Natural Resources Chesapeake and Coastal Service (CCS) provides the science, financing, and technical services that State and local partners need to meet their water quality and habitat restoration goals. CCS's Habitat Restoration and Conservation Division works with federal, state, and local partners to apply innovative best management practices that reduce harmful run-off, increase coastal resiliency, and provide wildlife habitat through restoration, creation, and enhancement of riparian and stream systems. With increasing climate change concerns, CCS is adjusting restoration and conservation efforts to incorporate climate into decision-making.

Maryland's Changing Climate

Over the next century, Maryland expects increased winter-spring precipitation and run-off, warmer air and water temperatures, and relative sea level rise of at least 3.7 feet. One hundred years of data confirms that Maryland is warming on average by 1.8°F and by as much as 3.6°F in the winter. Wetter conditions have become prevalent in March and September, while July and August have become drier. These trends will impact the success and efficiency of restoration practices along our dynamic coast.

Habitat restoration guidance in a changing climate

- Build coastal resiliency through living shoreline implementation, invasive species management, or vegetation selection for future climate conditions.
- Employ a landscape approach to restoration and conservation. Maintain green corridors, protect against fragmentation, and facilitate habitat migration.
- Maintain, identify, and protect new marsh migration corridors.
- Create habitat mosaics that may be more resilient to climate change impacts, such as sea level rise.
- Reconnect streams with their floodplains to reduce the flashiness of storm flows, improve water quality, and increase habitat benefits.
- Understand interactions between climate change and other stressors that impact ecosystems, such as development or landscape change.
- Incorporate uncertainty into project planning and design by planning for multiple climate scenarios.
- Target areas that will be sustainable under future conditions.
- Consider slope and site elevation in planning and design to aid in vegetation migration and mitigate the immediate impacts of sea level rise.
- Monitor, review, and revise projects as needed. Acquire baseline data, such as water and surface elevations or vegetation transects.

EXISTING PRACTICES PROVIDE A VALUE ADDED BENEFIT FOR REDUCING CLIMATE RISK

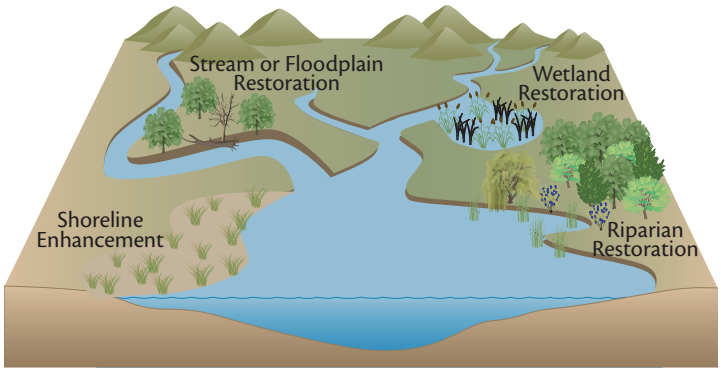
Management Practice	Nutrient Benefit	Climate Resilience Benefit				
		Temperature Reduction	Storm Buffer	Drought Buffer	Sea Level Rise Buffer	Wildlife Corridor
Stream Restoration	●	◖	◖			●
Forest Buffer	●	●	●			●
Wetlands	●		●	●	●	●
Shoreline Erosion Control	●		●		●	
Vegetated Open Channel	●		●			

* Practices designated with a ◖ potentially buffer against climate impacts and could be enhanced through modifications suggested in this document.

ADDRESSING CLIMATE CHANGE WITHIN RESTORATION PROJECTS

Adaptive management supports restoration and enhancement activities

CCS conducts in-house restoration projects to address coastal resiliency, water quality, and wildlife habitat. Technical and financial assistance is also provided to federal, state, county and municipal governments. A general project implementation process directs most activities related to shoreline, riparian, stream, floodplain, wetland, and aquatic enhancement and restoration. Throughout project planning and implementation, an adaptive management framework is used to consider and respond to climate impacts.



Key Project Steps	Climate Considerations
Project Targeting & Prioritization	Targeting and prioritization can identify restoration sites at most risk to climate change impacts, or highlight where restoration may enhance coastal resiliency. Sea level rise, migration potential, and other climate factors are considered during site selection.
Site Analysis	Sea level rise data are referenced and considered in living shoreline and other tidally-influenced restoration projects. Site-specific factors, such as elevation or floodplain presence, are noted during field visits to predict future conditions, inform resilient project designs, and ensure long-term project success.
Design	Design criteria can address climate impacts and improve project resilience. Criteria include species selection, hydrologic and floodplain connectivity, infiltration, and the maximization of wetland areas. These criteria address species diversity and natural succession, on-site water storage capacity, and stormflow flashiness. CCS can alter designs to handle precipitation events or hydrology fluctuations.
Environmental Review	Reviewers consider sea level rise and other climate factors for projects with long expected life spans. Projects involving sensitive species and habitats, such as coldwater streams, are addressed during project review because climate impacts may significantly alter these sites.
Project Construction	CCS addresses changing environmental conditions during project construction as needed by reacting to high intensity rain events, seches, tropical storms, or other weather events that impact construction progress and timing. As the climate becomes less predictable, CCS will continue utilizing adaptive management techniques within project planning and construction.
Monitoring	Monitoring and adaptive management allow CCS to address climate change during current and future restoration projects by providing for perpetual design improvements. If the vegetation or structural stability of a project is threatened, then actions can be taken to ensure long-term project success.

CLIMATE TOOLS AND RESOURCES

The following data are freely available on CCS's online data viewing platform - The Coastal Atlas (http://dnr.maryland.gov/ccs/coastalatlas/) - and can be used to consider climate change throughout project planning and implementation.

1. Sea Level Rise Vulnerability: These vulnerability layers display 2, 5, and 10-feet inundation risk zones.
2. Sea Level Affecting Marshes Model (SLAMM): SLAMM predicts future shoreline modifications and wetland change for 16 various wetland classifications.
3. Erosion Vulnerability Assessment Tool (EVA): EVA is a shoreline planning tool developed to identify shorelines with historic patterns of instability, as well as shorelines that support natural, social, or economic resources.
4. Storm Surge Risk: The US Army Corps of Engineers completed two hurricane evacuation studies for the eastern and western shores of Maryland. Storm surge areas were developed using the Sea, Level, and Overland Surges from Hurricanes (SLOSH) model.

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